STK. # 6202

INSTRUCTION MANUAL FOR

MODEL # 8050/50-10A-5DP

Series 8000

SERIAL # 1/2123

BETA ELECTRIC CORP.

NEW YORK, N. Y.

NOTE:

Please read the entire instruction manual thoroughly before attempting to operate the unit.

If this is not convenient, please read the operating instructions completely before applying power for the first time.

BETA ELECTRIC CORP.,

NEW YORK 29, N. Y.

INSTRUCTION MANUAL

S E R I E S 8 0 0 0

POWER SUPPLIES & "HIPOT" TESTERS

0-25,000 THROUGH 0-50,000 VOLTS AC (PEAK)

UP TO 10 MILLIAMPERES RMS

AND

0-25,000 THROUGH 0-50,000 VOLTS DC (AVERAGE)

AT 1, 2, 5, OR 10 MILLIAMPERES

February, 1955

INSTRUCTION MANUAL

FOR

MODELS 8025/25-5,10A-2,5,10D
8030/30-5,10A-1,2,5,10D
8025/50-5,10A-1,2,5,10D
8050/50-5,10A-1,2,5,10D

THIS MANUAL COVERS THE FOLLOWING DESIGNS:

DN	High voltage negative on dc.
DP	High voltage positive on dc.
DR	High voltage reversible on dc.
-A	Dual range kilovoltmeter on ac and dc.
-B1	Adjustable overload relay on ac and dc (standard range).
-B2	Adjustable overload relay on ac and dc (wide range.)
-C1	Magnetic line voltage stabilizer.
-C2	Electronic line voltage stabilizer.
-D	Electromechanical regulation.
-F	Fine output voltage control.
-H	Momentary high voltage application.
-HL	Momentary and continuous high voltage application.
-HT	Automatically timed high voltage application.
-L	0.1% rms ripple at maximum voltage AND current.
-M1	Single range load current meter.
-M2	Dual range load current meter.
-M3	Triple range load current meter.
-NZa	No zero start interlock.
-NZb	Zero start interlock and bypass feature.
-OV	Adjustable overvoltage relay, 0.1 to 1.1 max. voltage.
-S	DC output reversible by switch on front panel.
-(220)	220 volts, 60 cycles, main power.
-(110/220)	[illegible]

SECTION I - - - - - - SPECIFICATIONS

A: ELECTRICAL:

(a) Input voltage: 105-125 volts, 50/60 cycles, single phase (117 volts nominal).

(b) Input current: Maximum input volt-amperes are either 1.2 times maximum rated ac voltampere output, or 2.2 times maximum dc output, whichever is greater.

(c) Output voltage: Model nomenclature determines PEAK KV AC voltage and AVERAGE KV DC voltage. Thus:
Model 8025/50 provides (1) 0-25,000 volts PEAK AC, continuously variable; (2) 0-50,000 volts AVERAGE DC, continuously variable.

(d) Output current: Model nomenclature determines RMS MILLIAMPERES FOR AC and AVERAGE MILLIAMPERES FOR DC. Thus:
-5A -2D provides (1) 5 milliamperes rms on ac.
(2) 2 milliamperes average on dc.

(e) Polarity:
1: (On ac) "hot" terminal, ± rated kv peak, sine wave, to ground (tank).
2: (On dc) -DN, output lead negative with respect to ground (tank).
OR: -DP, output lead positive with respect to ground (tank).
OR: -DR, output lead reversible with respect to ground (tank).

(f) Ripple (on dc):
a: Less than 1% rms at any output voltage and no load.
b: Less than 5% rms at maximum kv and maximum ma.

(g) Regulation:
1: (On ac) Internal impedance approximately 750,000 ohms.
2: (On dc) (-1 designs): internal resistance approximately 8 megohms.
(-2 designs): internal resistance approximately 5 megohms.
(-5 designs): internal resistance approximately 3 megohms.
(-10 designs): internal resistance approximately 1 megohm.
3: (-D designs): 1% regulation against line and load, at maximum output voltage and load current. Electromechanical regulation; recovery time up to 6 seconds.

(h) Line voltage stabilization: -C1 designs:
1: 1% on ac, for line voltage changes 95-135 V.
2: 1.5% on dc, for line voltage changes 95-135 V.
-C2 designs:
1: 0.2% on ac, for line voltage changes 95-135 V.

(h) continued:

2: 0.25% on dc, for line voltage changes 95-135V.

(i) Meters:

(I) OUTPUT VOLTAGE:

(A): ALL DESIGNS EXCEPT -A:

1: (for ac).
8025 designs: 0-25 KILOVOLTS PEAK AC;
5% initial accuracy; 4" square bakelite case.
8030 designs: 0-30 KILOVOLTS PEAK AC;
5% initial accuracy; 4" square bakelite case.
8050 designs: 0-50 KILOVOLTS PEAK AC;
5% initial accuracy; 4" square bakelite case.

2: (for dc).
8025 designs: 0-25 KILOVOLTS DC; 3%
initial accuracy; 4" square bakelite case.
8030 designs: 0-30 KILOVOLTS DC; 3%
initial accuracy; 4" square bakelite case.
8050 designs: 0-50 KILOVOLTS DC; 3%
initial accuracy; 4" square bakelite case.

(B): -A DESIGNS:

1: (for ac).
8025 designs: 0-10/25 KILOVOLTS PEAK AC;
5% initial accuracy on both ranges, 4" square bakelite case.
8030 designs: 0-10/30 KILOVOLTS PEAK AC;
5% initial accuracy on both ranges, 4" square bakelite case.
8050 designs: 0-20/50 KILOVOLTS PEAK AC;
5% initial accuracy on both ranges; 4" square bakelite case.

2: (for dc).
8025 designs: 0-10/25 KILOVOLTS DC; 3% initial accuracy on both ranges, 4" square bakelite case.
8030 designs: 0-10/30 KILOVOLTS DC; 3% initial accuracy on both ranges, 4" square bakelite case.
8050 designs: 0-20/50 KILOVOLTS DC; 3% initial accuracy on both ranges, 4" square bakelite case.

(II) OUTPUT CURRENT:

(A): (-M1 DESIGNS): (THIS IS STANDARD ON ALL UNITS, & "M1" IS NOT DESIGNATED).

1: (for ac).
0-5 or 10 MILLIAMPERES RMS, 4" square bakelite case, 5% initial accuracy. -5A or -10A designs respectively.

2: (for dc).
0-1, or 2, or 5 or 10 MILLIAMPERES DC, 3% initial accuracy; 4" square case. (1D, 2D, 5D, 10D designs respectively.)

(B): (-M2 DESIGNS):

1: (for ac).
0-1/5 or 0-1/10 MILLIAMPERES RMS, 4" square bakelite case; 5% initial accuracy on both ranges (-5A, -10A designs respectively).

2: (for dc).
0-0.2/1 or 0-0.5/2 or 0-1/5 or 0-2/10

(i) continued:

MILLIAMPERES DC; 3% initial accuracy on both ranges, 4" square bakelite case; (-1D, -2D, -5D, -10D designs respectively).

(C): (-M3 DESIGNS):

1: (for ac).
0-0.2/1/5 or 0-0.2/1/10 MILLIAMPERES RMS, 4" square bakelite case; 5% initial accuracy on all ranges; (-5A, -10A designs respectively).

2: (for dc):
0-0.05/0.2/1 or 0-0.1/0.5/2 or 0-0/1/1/5 or 0-0.1/1/10 MILLIAMPERES DC; 3% initial accuracy on all ranges; 4" square case; (-1D, -2D, -5D, -10D designs respectively).

(j) Safety features:

1: Provision for external interlock.
2: Interlocks on control cabinet doors.
3: Automatic output voltage shorting mechanism inside the power supply that reduces the output voltage to zero whenever primary power is removed.
4: Series resistance in output circuit limiting initial short circuit current surges available from the power supply.
5: On units with output voltamperes greater than 300, or voltage greater than 30,000 volts, a zero start interlock ensures zero output voltage upon initial application of high voltage to load.

(k) Protective features:

1: Overload tripping circuit which removes input power for loads over 7 milliamperes, on -5A, or 14 milliamperes rms for -10A on ac; or, on dc:
(-1 designs) 2 ma.
(-2 designs) 4 ma.
(-5 designs) 6 ma.
(-10 designs) 12 ma.

-B1 designs:

1.5—7 ma, for -5A designs, or 3-14 ma, for -10A designs, on ac; or, on dc:
(-1 designs) 0.75-2 ma
(-2 designs) 0.75-3 ma
(-5 designs) 1.5-6 ma
(-10 designs) 2.0-12 ma.

-B2 designs:

0.1-0.9/0.9-7 ma, for -5A designs, or 0.3-3/3-14 ma, on ac; or on dc:
(-1 designs) 0.06-0.6/0.6-2 ma
(-2 designs) 0.07-0.7/0.7-4 ma
(-5 designs) 0.07-0.7/0.7-6 ma
(-10 designs) 0.12-1.2/1.2-10 ma

2: Fuses in both sides of main line.
3: Fuse in input circuit of high voltage transformer.
4: Fuse in control and filament power circuit.
5: Surge suppressing neon glow lamps across metering and overload relaying circuits.
6: Spark gaps from filament transformer primary to ground.
7: Spark gaps from high voltage transformer primary to ground.

(l) Controls:

1: CONTROL & FILAMENT POWER toggle switch.
2: HIGH VOLTAGE CONTROL covat*. (All designs except -D; rheostat on -D designs.)
3: HIGH VOLTAGE ON pushbutton.
4: HIGH VOLTAGE OFF & OVERLOAD RESET pushbutton. (HIGH VOLTAGE OFF not included in -E designs).
5: AC-DC metering and relaying selector switch.
6: (-R designs only): Meter Polarity Reversing switch.
7: (-A designs only): OUTPUT VOLTAGE meter range selector switch.
8: (-B1 and -B2 designs only): OVERLOAD TRIP CONTROL rheostat.
9: (-B2 designs only): OVERLOAD RANGE CONTROL selector switch.
10: (-F designs only): FINE HIGH VOLTAGE CONTROL covat*.
11: (-HL designs only): HIGH VOLTAGE LOCK pushbutton.
12: (-HT designs only): HIGH VOLTAGE ON TIME CONTROL.
13: (-M2,-M3 designs only): OUTPUT CURRENT meter range selector switch.
14: (-NLb designs only): ZERO START BYPASS pushbutton.
15: (-OV designs only): OVERVOLTAGE TRIP CONTROL rheostat.
16: (-S designs only): DC HIGH VOLTAGE POLARITY selector switch.

(m) Pilot Lights:

1: 115 volt incandescent:
   a: CONTROL & FILAMENT POWER on, green.
   b: HIGH VOLTAGE ON, red.
   c: OVERLOAD, yellow.
2: Neon:
   a: MAIN FUSES open (2).
   b: DOOR INTERLOCK OPEN.
   c: EXTERNAL INTERLOCK OPEN.
   d: SET HIGH VOLTAGE CONTROL TO ZERO (not in -NLa designs, or per I,A,j,5.
   e: HIGH VOLTAGE TRANSFORMER INPUT FUSE OPEN.
   f: CONTROL & FILAMENT POWER Fuse open.
   g: AUX. 115 VOLT AC OUTLET FUSE open.
   h: (-R, -D designs only): HIGH VOLTAGE (+) or HIGH VOLTAGE (-) (two pilot lights.)

*COVAT - - COntinuously Variable Auto Transformer; i.e., powerstat, variac, etc.

(n) Power connections:

Input: Standard recessed 2-prong male receptacle, with 6' line cord.

Output: Oil insulated units: 18" safety x-ray cable, with anti-corona bell and ball.
Air insulated units: Feed through bushing.

(o) Auxiliary feature: Standard 2-prong, 117 volt convenience outlet, energized when the control cabinet is energized.

B: MECHANICAL:

1) Control cabinet:

Size: 22-1/2" wide x 20-1/2" high x 20" deep.
Weight: 78 pounds.
Finish: Gray hammertone.

2) High voltage section:
a: Air insulated: (1) Model #'s 8025,30/25,30-5A,10A-1D,2D

Size: 22-1/2" wide x 20" deep x 25" high.
Weight: 150 pounds, approximately.
Finish: Gray hammertone.

b: Oil insulated (2) Model #'s 8025,30/25,30-5A,10A-5D,10D
8025/50-5A,10A-1D,2D

Tank:

Size: 22-1/2" x 17-1/2" x 26" high overall, including 4" swivel casters.
Weight: 150 pounds, without oil.
400 pounds, with oil.
Finish: Gray hammertone.
Oil requirements: 32 gallons, 25 kv test, high grade transformer oil.

c: Oil insulated: (3) Model #'s 8025/50-5A,10A-5D
8050/50-5A,10A-1,2,5D,10D

Tank:

Size: 22-1/2" wide x 22-1/2" deep x 32-1/4" high, overall, including 4" swivel casters.
Weight: 212 pounds, without oil.
612 pounds, with oil.
Finish: Gray hammertone.
Oil requirements: 52 gallons, 25 kv test, high grade transformer oil.

d: Tank-control section adapter:

Size: 10" high
Weight: 32 pounds
Finish: Gray hammertone.

e: Overall height:

Air insulated: 50"
Oil insulated: (1) 57"
(2) 63"

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SECTION II - GENERAL

a: The Beta Electric Corp. Series 8000 power supplies, 0-25,000 volts through 50,000 volts peak ac, and 25,000 volts through 50,000 volts average dc, have been designed to provide compact, reliable, mobile, high voltage sources of up to 10 milliamperes rms or up to 10 milliamperes dc, for insulation testing, dust, powder, and paint precipitation applications, etc.

These units are suitable for any application where the specified voltages at moderate current is required, and unusual reliability and conveience of use is desired.

b: On oil insulated designs, the ac output is available from one recessed socket, and the dc is available from another socket. A single cable is provided to choose the ac or dc; a plug is employed for the unused socket. On air insulated units, feedthrough bushings are used.

Three basic designs are available:

-DN, with high voltage dc NEGATIVE with respect to ground.
-DP, with high voltage dc POSITIVE with respect to ground.
-DR, with high voltage dc REVERSIBLE with respect to ground.

In the -DR designs, polarity is reversed by interchanging the positions of two leads in the high voltage tank, accessible from portholes in the tank top.(In the -S designs, polarity reversal is effected by means of a switch on the front panel, and a solenoid in the tank.)

c: The basic high voltage circuit is a half-wave voltage rectifier or doubler for dc. This provides the advantage of using smaller rectifiers, power transformers, and capacitors than the conventional full-wave rectifier requires. By operating the high voltage components under oil, extreme reliability and freedom from corona result, in voltages above 30 kv.

d: High voltage is controlled by means of a covat* which varies with ac input to the high voltage rectifying circuit. This covat is interlocked so that the setting must be at zero for initial application of high voltage. (This is bypassed in the N2a and N2b designs, requiring a "slow down" circuit; also, see I,A,j,5.)

e: The power supply is in two sections, a control cabinet and a high voltage section. The two may be separated for remote operation of the high voltage tank, or may be mounted together, (by means of an adapter in oil designs,) for integral floor operation. The unit may then be fully mobile, if the high voltage section is supplied with large swivel casters (available on special order).

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SECTION III - - THEORY OF OPERATION

All of the circuits and functions of the power supply are quite straight-forward, and can be readily understood by reference to the basic schematic circuit diagram, β-b-8000-1. Main ac power and dc circuits are indicated heavily. Light lines represent control circuits for meters, filtering or indicating circuits. In addition, the detailed parts list supplied herewith describes the function of each component.

Several novel features which are typical of Beta Electric Corp. engineering to reduce size and cost of the power supply, and to increase convenience of use, are briefly outlined herewith. In addition, unusual circuit features are described:

1: Neon pilot light illuminating resistors:

Resistors such as R1 ensure illumination of adjacent neon pilot lights in case of blown fuse or open switch paralleled by the neon light, and open circuit beyond the resistor.

2: Incandescent pilot light ballast resistors:

Resistors such as R2 are ballast resistors for the incandescent pilot lights, to lengthen lamp life.

3: Holding relay for overload protection:

Relay K3 pulls in when contacts 2a of the overload relay K2 close momentarily. When K3 is energized, contacts 3a close and maintain K3 energized, even though contacts 2a have now opened up, removing primary power from the high voltage circuit and eliminating the overload condition.

Depressing S2 HIGH VOLTAGE OFF & OVERLOAD or OVERVOLTAGE RESET, de-energizes K3 and resets the system for operation after an overload.

Pilot light I10, OVERLOAD, is illuminated for the overload condition.

4a: Zero start interlock S5 and holding relay for high voltage, K1:

FOR ALL DESIGNS EXCEPT -NZa. Relay K1 can be energized only if the HIGH VOLTAGE ON pushbutton is energized, and the zero start interlock is closed by means of the HIGH VOLTAGE CONTROL covat* T1 being in the most counter-clockwise or zero start position, closing S5.

If S5 is not closed, and S3 is depressed, pilot light I13 SET HIGH VOLTAGE CONTROL TO ZERO will be illuminated.

With S3 and S5 properly closed, K1 will be energized, closing contacts 1a. This bypasses switches S3 and S5, allowing S3 to be released and S5 to be opened by T1 being turned away from zero. K1 will be held by contacts 1a and the relay will be de-energized only if S2 is depressed or an overload occurs.

- - - -

4b: (-N1a and N2b designs:) Slow down circuit:

Resistor R12 in conjunction with the incandescent lamp I15 constitute a "slow-down" circuit to prevent high voltage surges from appearing in the secondary circuit of the high voltage transformer T2, when primary power is suddenly applied. Before primary power is applied to T2, and simultaneously across I15, the resistance of I15 is comparatively low, less than the resistance of R12. Therefore, the voltage across the primary of T2 will be less than 1/2 line voltage, even if T1 is at the maximum output position. It takes several cycles for I15 to warm up to operating temperature, at which condition, its "hot" resistance is almost 20 times its "cold" resistance.

Therefore, at the steady state the presence of I15 affects the output voltage only slightly. But its effect in reducing starting surges when primary power is first applied increases the life of the high voltage transformer considerably, and eliminates the possibility of voltage overshoot.

5: High voltage circuits:

(For units in which the dc available is TWICE the ac, for example, 8025/50.) The high voltage half-wave doubling circuit consists of transformer T2 in conjunction with rectifiers V1 and V2 and capacitors C1 and C2.

(For units in which the dc available is equal to the ac, for example 8025/25.) The half-wave rectifiers consists of T2, V1 and C1. The ac is brought out from the "high" end of T2.

6: Metering and overload circuits:

The output voltage metering circuit consists of a resistor R10 in series with meter M1, OUTPUT VOLTAGE, and calibrating resistors R13, etc. This reads the average output voltage, when dc is being drawn, and the peak of the output of T2, when the ac load is used.

In series with the ground return leg of T2 is the overload relay K2, operated by bridge rectifier CR1. This relay is shunted with resistor R29 and R30, to ensure pull in at appropriate rated currents on ac or on dc.

The neon glow lamp protectors I8 and I12 will fire when excessive current passing through M1 or K2 builds up sufficient voltage. The load current meter M2 is in a separate "LOW SIDE RETURN" lead, precluding the possibility of measuring leakage of loads that have one end permanently grounded.

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SECTION IV - OPERATING INSTRUCTIONS

A: MECHANICAL:

1: Open the crates and all cartons carefully. Examine all components for visible damage.

REPORT ALL DAMAGE, (DETERMINED FROM VISIBLE INSPECTION AND FROM SUBSEQUENT ATTEMPTS TO PUT THE POWER SUPPLY INTO OPERATION) TO THE CARRIER AT ONCE. PLEASE SEND A COPY TO THE BETA ELECTRIC CORP.

THE POWER SUPPLY WAS IN PERFECT OPERATING CONDITION BEFORE IT WAS SHIPPED FROM THE BETA ELECTRIC CORP. PREMISES; ANY MALFUNCTIONING UPON ARRIVAL AT YOUR PREMISES IS DUE TO DAMAGE OCCURRING IN SHIPMENT.

2: (For oil units) Loosen the flange bolts that hold the tank top with the cover-mounted high voltage components.

3: Remove the cover-mounted high voltage components from the tank.

4: Examine all components carefully for visible damage.

5: Check continuity of the T2 secondary coils and the various resistors. Refer to drawing β-c-8000-1 for component values. Check continuity of all high voltage leads.

6: Install the rectifier or rectifiers into the socket(s) as required, and connect the plate cap(s).

7: Loosen the automatic output shorting mechanism.

8: (-R designs only): Set the polarity reversing links corresponding to the desired dc polarity. See drawing β-b-8000-2.

9: (For oil units): Fill the tank with oil to the level indicated by the stamped line.

10: (For oil units): Lower the frame back into the tank slowly, to minimize splashing and aeration of the oil.

FOR DESK OPERATION OF CONTROLS:

11: Tighten the bolts with a small hand wrench.

12: Remove the adapter from the base of the control section.

13: Set the high voltage section and high voltage controls where desired. Splice additional lengths onto the interconnecting cable, if needed.

14: Insert the output cable, for ac or dc, as desired, into the sockets, or connect to the desired bushing. Use Dow Corning #4 Silicone lubricant, or equivalent, on the ac connector. Install the plug into place, in the unused socket, and tighten.

FOR INTEGRAL OPERATION:

Leave as received for air units.

(For oil units) Perform step 12 above, then:

15a: Set the separator section atop the tank, and tighten by means of the bolts, to the tank top and flange. The adapter has a keying black mark, as have the cabinet, tank, and flange for alignment.

b: Set the control cabinet into place. Connect the interconnecting cable.

16: Insert the high voltage output cable per step 14 above.

B: ELECTRICAL:

1: Ground the control section by means of the binding post provided for this purpose on the chassis rear; use bare wire at least #12 gauge.

2: If the cabinet and tank are separate, ground the tank as well.

3: Remove the shorts from the meters.

4: Set the plug-in relays into position on the chassis.

5: Connect the output cable to the load.

6: Connect the power supply to a source of 117 volts, 60 cycles, by means of the line cord and socket provided for this purpose.

7: Connect an interlock, closed in the SAFE position, to pins "a" and "d" of the plug that mates with the socket on the chassis rear, labelled FOR EXTERNAL INTERLOCK.

8: Turn the HIGH VOLTAGE CONTROL to zero.

9: Throw the CONTROL & FILAMENT POWER switch to ON. Set the METER POLARITY REVERSAL switch to (+) or (-) corresponding to the link settings in IV,A,8 above. (This latter pertains to -R designs only).

10: (-B1 designs only) Turn the OVERLOAD TRIP CONTROL to the dial setting corresponding to the desired overload trip point. Refer to drawing β-a-8000-4 for calibration.

11: (-HT designs only) Set the HIGH VOLTAGE TIMER to the desired value.

12: (-N2a or N2b designs only) Set the HIGH VOLTAGE CONTROL to the dial setting corresponding to the desired value of output voltage. Refer to drawing β-a-8000-6 for calibration.

13: Depress the HIGH VOLTAGE ON pushbutton.
(-H designs only) this pushbutton must be held depressed for high voltage to stay on.

(-HL designs only) depress the HIGH VOLTAGE ON pushbutton for momentary high voltage. Depress both the HIGH VOLTAGE ON and HIGH VOLTAGE LOCK pushbuttons for permanent high voltage.

14: (-OV designs only) Turn the OVERVOLTAGE TRIP CONTROL to the dial setting corresponding to the desired overvoltage trip point. Refer to drawing β-a-8000-5 for the calibration.

15: Turn the HIGH VOLTAGE CONTROL till the desired output voltage is indicated.
NOTE: THE METERS ARE PROTECTED AGAINST OVERLOADS ON ALL RANGES.

16: TO TURN OFF:
a: Turn the HIGH VOLTAGE CONTROL to zero, and allow the output to drop below 10 kv (Recommended, not mandatory.)

b: Depress the HIGH VOLTAGE OFF pushbutton. (On -H designs, release the HIGH VOLTAGE ON pushbutton.)

c: Throw the CONTROL & FILAMENT POWER switch to OFF.

17: TO RESET AFTER AN OVERLOAD:
a: Turn the HIGH VOLTAGE CONTROL to zero (Recommended, not mandatory).

b: Depress the OVERLOAD RESET pushbutton.

c: Remove the cause, in case of overload.

d: Re-energize per steps 10 and 14 above.

* *

SECTION V - IMPORTANT PRECAUTIONS

1: ALWAYS OPERATE WITH A GOOD EXTERNAL GROUND, AT LEAST #12 GAUGE. A bare wire is recommended.

2: KEEP ALL OPERATING PERSONNEL WELL AWAY FROM THE OUTPUT LEAD, at least 2 feet.

Although a lethal amount of power is not available from either the dc or ac outputs, nevertheless, very unpleasant shocks are possible, with possible undesirable secondary effects due to mechanical reaction.

3: Always allow the output voltage reading to drop below 10 kv dc before depressing the HIGH VOLTAGE OFF pushbutton. The reason for this is that when the HIGH VOLTAGE OFF pushbutton is depressed, the shorting solenoid is de-energized,

and an arc forms as the ground bar approaches the high voltage point. Although the arc is limited by series resistance, and lasts for a short time, nevertheless repeated arcs at high voltage will cause deterioration of the oil in oil insulated units, or of the contacts, in air insulated units. Hence, steps IV,B,15a is recommended.

4: The door interlock is of the type that closes the switch if the plunger is pushed in by normal door operation, or if the plunger is PULLED OUT. If the plunger is pulled out during servicing, suitable precautions should be taken to ensure that unauthorized personnel do not operate the controls. The best method is to disconnect the input plug. The interlock resets automatically when the door is closed after servicing.

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SECTION VI - - - - - - - - -DRAWINGS

The following drawings are provided with this manual, in addition to the component symbols, in the standard parts specification booklet:

NOTE: EACH DRAWING DESIGNATION HAS BETWEEN THE DRAWING SIZE LETTER AND THE DRAWING SEQUENCE NUMBER, THE FULL POWER SUPPLY SPECIFICATIONS. THUS, MODEL 8050/50-10A-5DP WOULD HAVE β-B-8050/50-10A-5DP-1.

1: β-b-8000-1, a complete schematic circuit diagram showing all circuit components. The power and high voltage dc circuits are indicated with heavy lines.

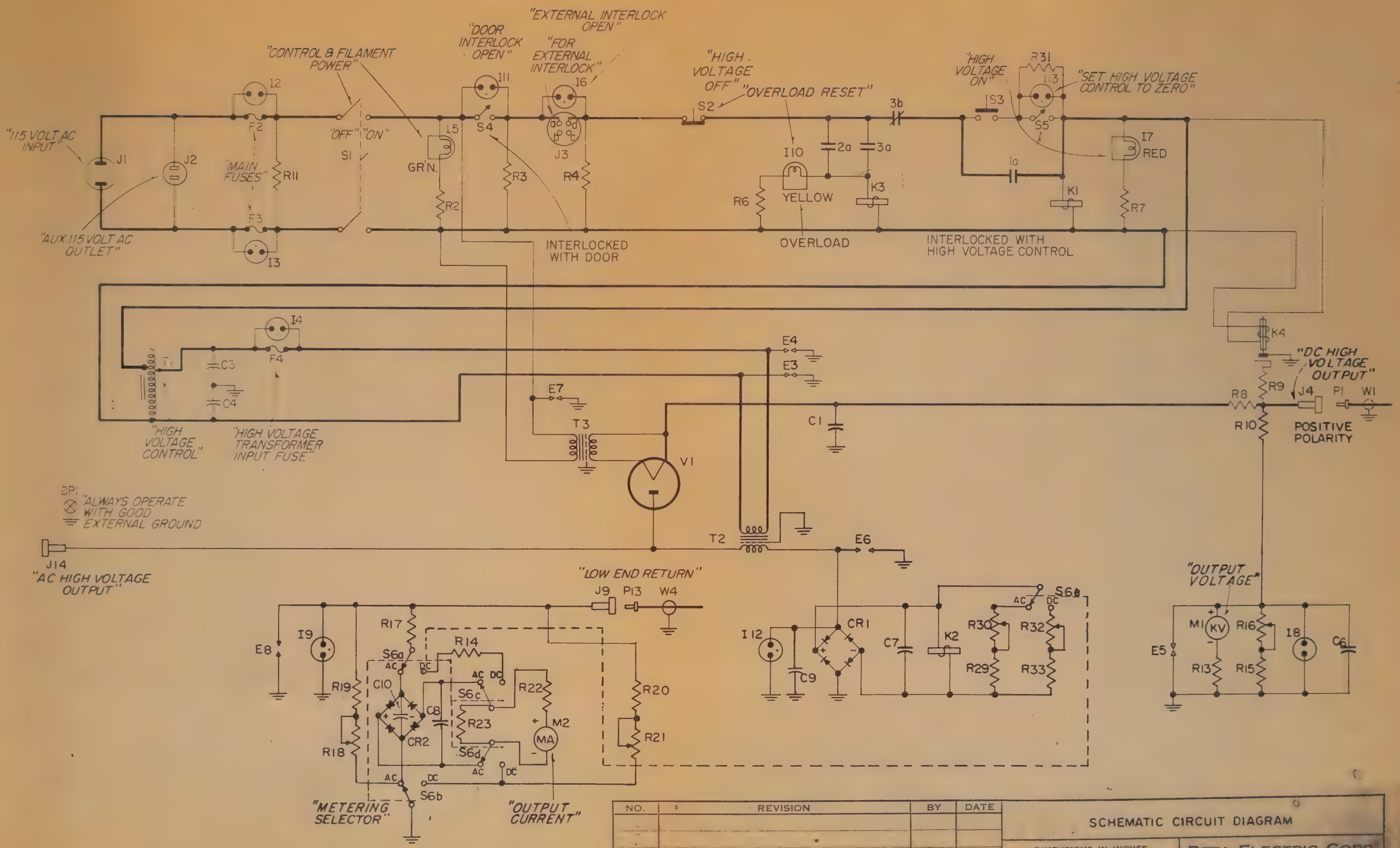
2: β-b-8000-2, showing parts placement on the control panel and chassis, and in the high voltage section.

3: β-c-8000-3, a schematic wiring diagram of the entire power supply. This is a point-to-point wiring diagram, indicating that all wires are number coded for ease of trouble shooting and component isolation.

4: β-a-8000-4, a calibration curve of the OVERLOAD TRIP CONTROL rheostat (for -B1 and -B2 designs.)

5: β-a-8000-5, a calibration curve of the OVERVOLTAGE TRIP CONTROL rheostat (for -OV designs.)

6: β-a-8000-6, a calibration curve of the HIGH VOLTAGE CONTROL setting vs. high voltage output, at no load (-NZa and NZb designs.)



NO.	REVISION	BY	DATE

SCHEMATIC CIRCUIT DIAGRAM

DIMENSIONS IN INCHES
DO NOT SCALE

DRAWN BY FC 12/27/54

CHECKED BY MP 2/8/55

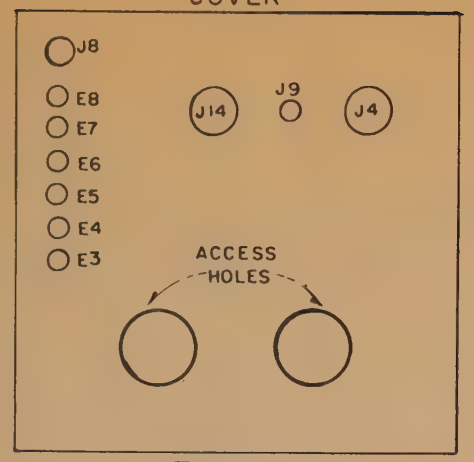
APPR'D BY

BETA ELECTRIC CORP.
NEW YORK 29, N. Y.

8050/50-10A-5DP-1
b

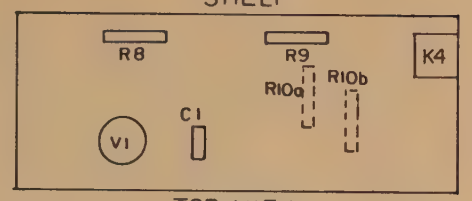
TANK

COVER

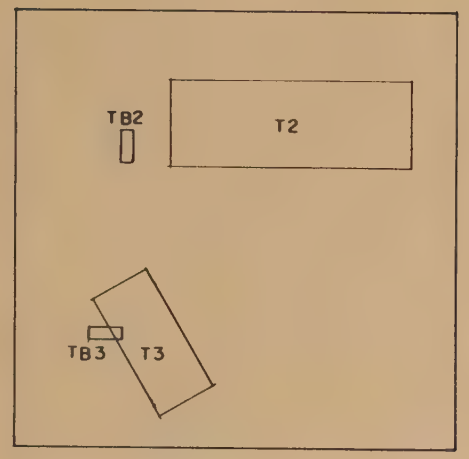


TOP VIEW

SHELF

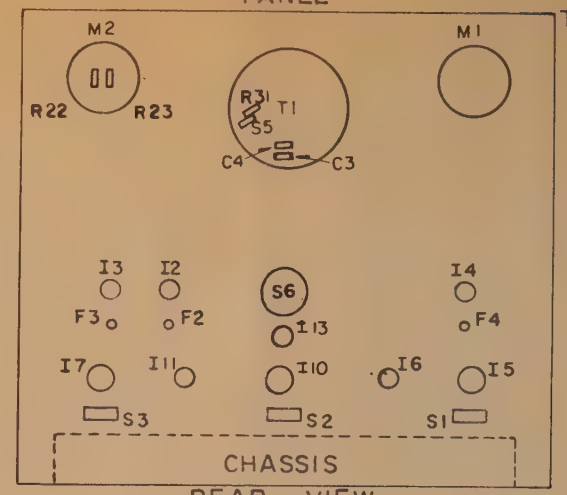


TOP VIEW



PANEL & CHASSIS

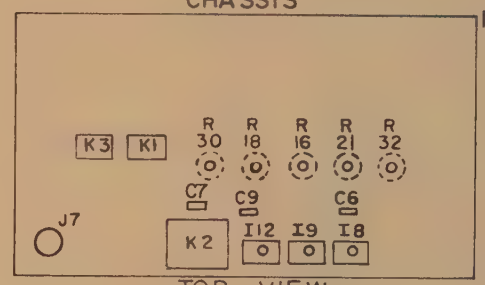
PANEL



TOP

REAR VIEW

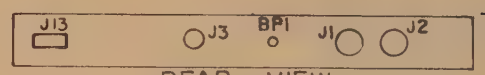
CHASSIS



FRONT

TOP VIEW

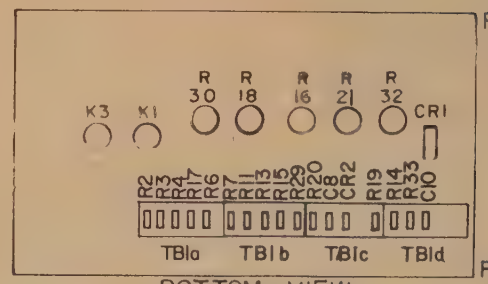
REAR



TOP

REAR VIEW

REAR



FRONT

BOTTOM VIEW

NO.	REVISION	BY	DATE

PARTS PLACEMENT

DIMENSIONS IN INCHES
DO NOT SCALE

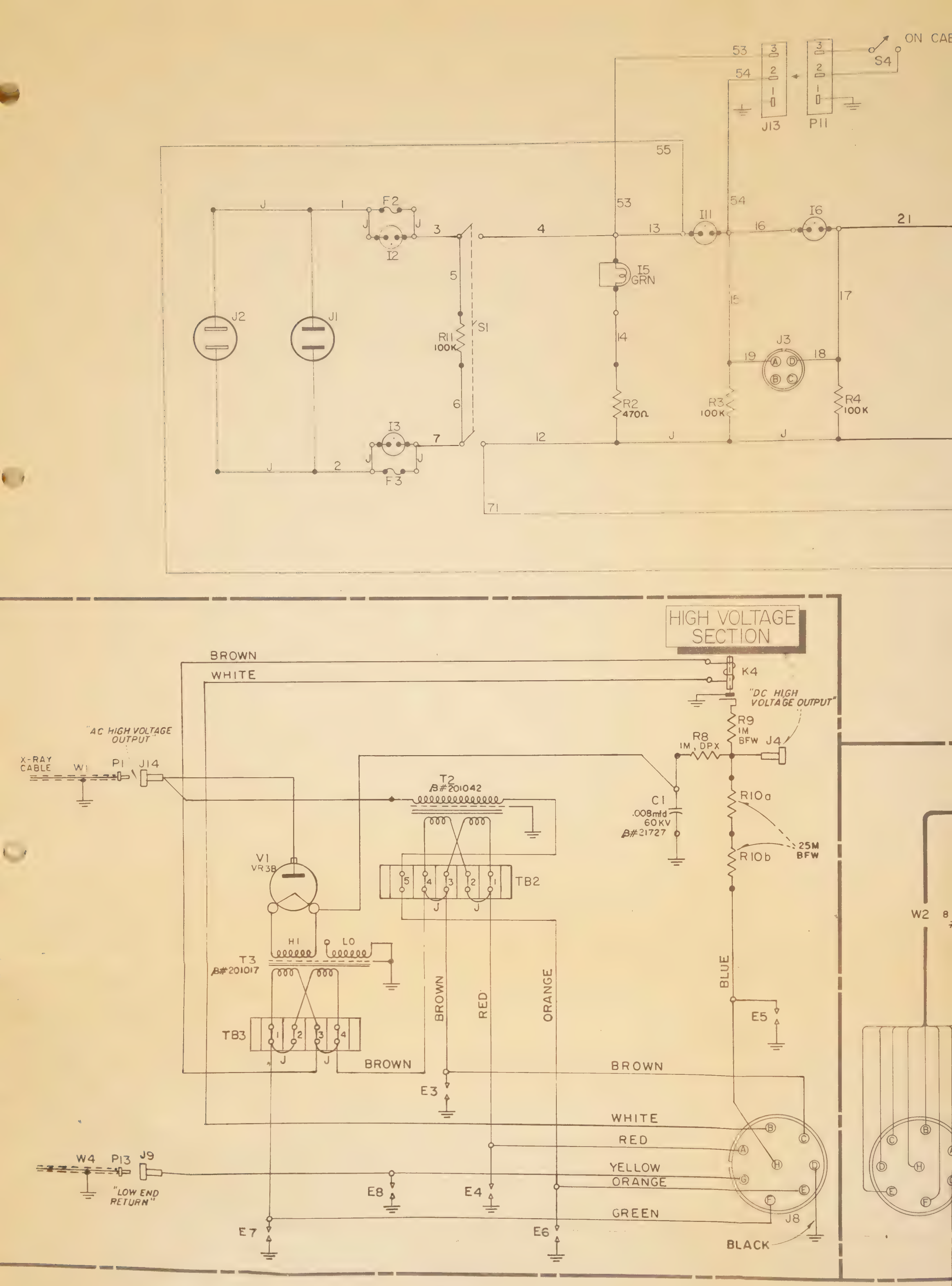
DRAWN BY F C 12/28/54

CHECKED BY MJ 2/8/55

APPR'D BY

BETA ELECTRIC CORP.
NEW YORK 29, N. Y.

D b 8050/50-10A-50-P-2



NOTES:
J DENOTES JUMPER
NUMBERS ON LINES REFER TO "QUIK-LABEL" CODE MARKERS ON EACH END OF ACTUAL WIRES
COLORS ON LINES CORRESPOND TO COLOR-CODING OF ACTUAL WIRES

#16 WIRE

R31
4 M
S5
125
126
I13
S3
S2
26
32
3b
36
38
40
59
"1"
2a
3a
1a
37
I7
RED
33
46
72
I10
34
YELLOW
35
J
45
T1
66
F4
I4
R6
470Ω
K3(b)
K1(a)
R7
470Ω
C3
C4
48
47
44
"4"
"3"
69
55
72
79
71
J7
PANEL &
CHASSIS
79
76
110
111
82
80
I9
NE32
.01 MFD
400V C6
I8
NE51
93
90
I12
NE32
M1(KV)
C9
0.05mfd
600V
94
98
R16
50K
R13
650K
R15
10K
104
127
85
117
117
CR1
C7
2mfd
200V
K2(a)
101
R33
600Ω
119
R32 1K
121
R29
250Ω
102
103
R30
1K
AC
DC
104
118
120
R17
100K
83
INTERCONNECTING
CABLE DETAILS
P5
P6
BP1
111
109
109
112
84
M2 MA
ON
METER
R22
50K
R23
18K
112
S6
113
R14
60K
114
AC DC
d
a
b
c
AC
DC
108
95
96
.05 MFD
600V
115
.05 MFD
600V C8
R21
10K
R19
1K
BLK
YEL
RED
91
88
C
10
R20
3K
CR2
YEL
R18
89
92

NO.	REVISION	BY	DATE

SCHEMATIC WIRING DIAGRAM

DIMENSIONS IN INCHES
DO NOT SCALE

DRAWN BY FC 12/23/54

CHECKED BY MJ 2/8/55

APPROVED BY

BETA ELECTRIC CORP.
NEW YORK 28 N. Y.

C 8050/50-10A-5DP-3

Parts List
Model 8050/50-10A-5DP Power Supply -1-

βeta Electric Corp.
New York 29, N.Y.

PART #	βETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
A1	Cabinet per dwg. β-c-A117.		Houses controls.
A2	Panel integral with A1.		Mounts controls.
A3	13A		Mounts control circuit components.
A4	39A Dwg. β-c-A116-217, β-c-A113-217.		Mounts high voltage circuits.
A5	Adapter β-cA127.		Mounts A1.
C1	.008 mfd, 60 kvdc; β#21727.	H.V.S.*	High voltage doublers and filters.
C2	NOT USED		
C3,4	4C	On T1	RF noise suppressors.
C5	NOT USED		
C6	7C	Chassis	M1, surge protector.
C7	2 µfd, 200V, Aerovox.	Chassis	Filter.
C8	.05 mfd, 600 volts.	Chassis	Filter.
C9,10	0.05 mfd, 600 volts.	Chassis	M2 surge protectors.
E1	2E	H.V.S.	Rectifier filament field suppressor.
E2	NOT USED		
E3-8	3E	H.V.S.	Surge suppressors.
F1	NOT USED.		
F2,3	2F 10 amperes.	Panel	As labelled.
F4	2F 8 amperes.	Panel	As labelled.
I1	NOT USED		
I2,3,4	1I	Panel	Blown fuse indicators.
I5	2I	Panel	Indicates condition as labelled.
I6	1I	Panel	Indicates condition as labelled.
I7	2I	Panel	Indicates condition as labelled.
I8	1I	Chassis	Surge protector.
I9	4I	Chassis	M2 surge protector.
I10	2I	Panel	Indicates condition as labelled.
I11	1I	Panel	Indicates condition as labelled.
I12	4I	Chassis	Surge protector.
I13	1I	Panel	Indicates as labelled.
I14	NOT USED	Panel	Indicates condition as labelled.
I15,16	NOT USED		
J1	1J	Chassis	As labelled.
J2	2J	Chassis	As labelled.
J3	9J	Chassis	As labelled.
J4	Transformer well, Flex-Ray; 110 kv peak.	H.V.S.	High voltage output jack, dc.
J5,6	NOT USED		
J7	11J	Chassis	Interconnector.
J8	10J	H.V.S.	Interconnector.
J9	Coaxial, Amphenol AN SO-239.	Tank	Low end return output jack.

* H.V.S. = High Voltage Section

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
J10-12	NOT USED		
J13	Socket, 3 pin; Cinch Jones #S-303-FP.	Chassis	Door interlock connector.
J14	As per J4.	H.V.S.	High voltage output jack, ac.
K1	21K	Chassis	High voltage on holding relay.
K2	0.5ma dc, 15kohm coil; SPDT, 110 V 60 cont. Kurman type BK35.	Chassis	Overload relay.
K3	21K	Chassis	Overload holding relay.
K4	115Vac coil; Soreng EX324-12100	H.V.S.	Output shorting solenoid.
K5,6	NOT USED.		
K7	NOT USED.	Chassis	Overvoltage holding relay.
M1	1M 0-50 kv dc; 0-50 kv peak.	Panel	Indicates as labelled.
M2	1M 0-5 ma dc, 0-10 ma RMS.	Panel	Indicates as labelled.
O1-4	10 four used.	Tank	Casters.
P1	Plug integral with W1.	On W1	Output cable connector.
P2,3	NOT USED.		
P4	8P	Chassis	Mates with J3.
P5	10P	On W2	Mates with J7.
P6	9P	On W2	Mates with J8.
P7,8	NOT USED.	H.V.S.	Mates with J5,6
P9	12P	On V1	Plate caps.
P10	NOT USED.		
P11	Plug, 3 pins, Cinch Jones #P-303-CCT.	Cabinet	Mates with J13.
P12	Dummy plug with handle, FlexRay.	H.V.S.	Dummy plug.
P13	Amphenol, AN PL-259, integral with W4.	On W4	Mates with J9.
R1	NOT USED.	Chassis	Neon pilot light return current path.
R2	2R	Chassis	Ballast.
R3,4	3R	Chassis	Neon pilot light return current path.
R5	NOT USED		
R6,7	2R	Chassis	Ballast.
R8	13R	H.V.S.	Short circuit current limiter.
R9	12R	H.V.S.	Grounding resistance.
R10a,b	42R	H.V.S.	Kilovoltmeter multipliers.
R11	3R	Chassis	Neon pilot light return current path.
R12a,b	NOT USED		
R13	32R 650k ohms.	Chassis	Fires I8 at excessive M1 current.
R14	32R 60k ohms.	Chassis	Fires I9 at excessive M2 current.
R15	32R 10k ohms.	Chassis	Coarse calibrator M1.

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
R16	28R	Chassis	Fine calibrator M1.
R17	32R 100k ohms.	Chassis	Fires I9 at excessive M2 current.
R18	27R 10k ohms.	Chassis	Fine calibrator M2 for ac range.
R19	32R 1k ohms.	Chassis	Coarse calibrator M2 for ac range.
R20	32R 3k ohms.	Chassis	Fine calibrator M2 for dc range.
R21	27R	Chassis	Coarse calibrator M2 for dc range.
R22	32R 50 k ohms (*R23*)	On M2	M2 sensitivity reducers.
R24-28	NOT USED.		
R29	32R 250 ohms.	Chassis	Coarse overload calibratorat ac range
R30	26R	Chassis	Fine overload calibrator at ac range.
R31	4 megohms, 1W, carbon, IRC.	On S5	"Sneak path" illumination suppressor.
R32	26R	Chassis	Fine overload calib. at ac range.
R33	32R 600 ohms.	Chassis	Coarse overload calib. at dc range.
S1	4S	Panel	Controls as labelled.
S2	Momentary pushbutton switch, 1NO, 1NC, break before make, 15A at 125V ac, RED, Square D class 9001, type G03.	Panel	Controls as labelled.
S3	As above, BLACK, type G01.	Panel	Controls as labelled.
S4	1S	Cabinet	Door interlock.
S5	2S	Panel	Zero start interlock.
S6	11S Rotary selector switch, 6 poles, 3 position, Centralab #2516.	Panel	Output selector switch.
T1	12T	Panel	Controls as labelled.
T2	14T	H.V.S.	High voltage transformer.
T3	4T	H.V.S.	Filament transformer.
V1	6.0V, 4.3A filament, 140 kv peak, 50 ma continuous, Dunlee type VR-3B.	H.V.S.	Rectifier.
W1	12' Flex-Ray shock proof cable, with aerial terminal, 110 kv peak insulation.	H.V.S.	Output cable, dc and ac.
W2	6W 6 feet.		Control cable.
W3	1W		Line cord.
W4	2W 12 feet.		Low end return.
XF1	NOT USED	Chassis	Holds respective fuse.
XF2-4	1XF	Panel	Hold respective fuses.
XI1	NOT USED	Chassis	Holds respective pilot light.
XI2-4	1XI	Panel	Hold respective pilot lights.
XI5	4XI green jewel.	Panel	Holds respective pilot light.
XI6	1XI	Panel	Holds respective pilot light.
*R23	18k ohms.	On M2	M2 sensitivity reducer.

PART NO.	BETA CODE NO. AND DESCRIPTION	LOCATION	FUNCTION
XI7	4XI red jewel	Panel	Holds respective pilot light.
XI8	3XI	Chassis	Holds respective pilot light.
XI9	5XI	Panel	Holds respective pilot light.
XI10	4XI yellow jewel	Panel	Holds respective pilot light.
XI11	1XI	Panel	Holds respective pilot light.
XI12	5XI	Chassis	Holds respective pilot light.
XI13	1XI	Panel	Holds respective pilot light.
XI14	4XI blue jewel	Panel	Holds respective pilot light.
XI15	NOT USED.		
XI16	NOT USED.	Panel	Holds respective pilot light.
XK1,3	2XV	Chassis	Hold respective relays.
XV1	8XV	Tank	Holds respective rectifier.
BP1	1BP	Chassis	Ground post.
TB1a,b,c,d	8TB	Chassis	Mount resistors.
TB2	2TB	Tank	T2 tie point.
TB3	2TB	Tank	T3 tie point.
CR1a-d	1CR	Chassis	K2 rectifiers.
CR2	3CR	TB1c	M2 rectifier.

BETA ELECTRIC CORP.

NEW YORK 29, N. Y.

This booklet contains standard symbols, letter nomenclature and detailed specifications of parts used in Beta Electric Corp. high voltage power supplies and other equipment.

In the parts list accompanying this instruction manual there are Beta code numbers for various circuit and structural components. The detailed specifications are contained in this booklet, and can be found under the proper code number heading.

The parts are listed numerically and alphabetically according to letter nomenclature.

In the parts list, detailed specifications are included only for those components that are not listed in the booklet.

JULY, 1952

C — CAPACITOR

F — FUSE

I — NEON GLOW LAMP

I — INCANDESCENT LAMP

J — 2-POLE MALE RECEPTACLE

J — 2-POLE FEMALE RECEPTACLE

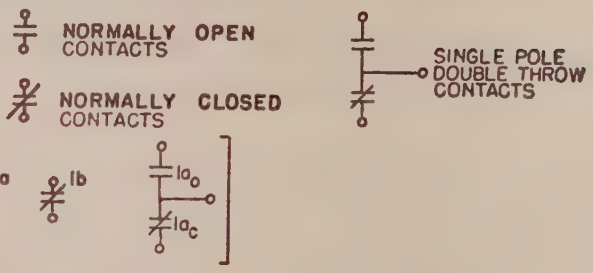
J — 3-POLE MALE RECEPTACLE

J — BANANA JACK

J —

"AN" RECEPTACLE

K — RELAY



K — SOLENOID RELAY

L — FILTER CHOKE

M —

METER

P — BANANA PLUG

R — RESISTOR, RHEOSTAT, POTENTIOMETER, ETC.

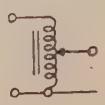
S — PUSHBUTTON SWITCH, NORMALLY CLOSED

S — PUSHBUTTON SWITCH, NORMALLY OPEN.

S — TOGGLE SWITCH, MICRO-SWITCH, ETC., ROTARY SNAP SWITCH, ETC.

S —

ROTARY SELECTOR SWITCH, GANGED.

T — TRANSFORMER,  COVAT

The following is an excerpt from 16B 16 (RE) 1 July 1946, the Bureau of Ships Interim Specification for Instruction Books for ELECTRONIC EQUIPMENT, par. Eli:

STANDARD COMPONENT DESIGNATIONS

SYMBOL	DEFINITION
A	Structural parts, panels, frames, castings, etc.
B	Motors and prime movers, self-synchronous motors, etc.
C	Capacitors of all types.
D	Dynamotors, rotary converters.
E	Miscellaneous electrical parts: insulators, knobs, brushes, antennas, etc.
F	Fuses.
G	Generators, exciters, etc.
H	Hardware, screws, bolts, studs, pins, etc.
I	Indicating devices,(except meters and thermometers), pilot lamps, etc.
J	Jacks and receptacles (fixed connectors, male or female).
K	Contactors, relays.
L	Inductors, r.f. and a.f.
M	Meters of all types, gauges, thermometers, etc.
O	Mechanical parts: bearings, shafts, couplings, gears, etc.
P	Plugs (movable connectors, male or female).
Q	Diaphragms (microphone, telephone, projector, etc).
R	Resistors, fixed and variable, potentiometers, attenuators, etc.
S	Switches, interlocks, thermostats, thermo-regulators.
T	Transformers, r.f., a.f., and power.
U	Hydraulic parts.
V	Vacuum and gaseous discharge tubes.
W	Wires, interconnecting cables, etc., wave guides, transmission lines, delay lines.
X	Sockets (electron tubes, pilot lamps, fuses, etc).[1]
Y	Mechanical oscillators, crystals, magnetostriction tubes, etc.
Z	Filters, i-f transformers, compound tuned circuit assemblies, etc., in a common container.
BT	Batteries.
CR	Rectifiers (electrochemical, copper oxide, selenium, crystal, etc., except vacuum or gaseous tubes).
HS	Handset (telephone and microphone combination).
HR	Heater
HT	Head telephones.
HX	Heat exchangers.
LS	Loudspeakers.
MG	Motor generators (single unit).
MI	Microphones (hand or chest set type).
TB	Terminal boards.
TY	Surge eliminators. (special discharge resistors).
VR	Voltage regulators, (except vacuum or gaseous tubes).

[1] The symbol designation for sockets shall bear the same basic number as for the associated component. To accomplish this, the appropriate symbol letter shall be prefixed with the letter 'X', e.g., use 'XV' for tube sockets, 'XI' for pilot lamps' sockets, etc.

Addenda and Errata for
Beta Electric Corp. standard parts list
July 1952

* *

ERRATA . . . . . .

Item # & Letter Desig.	Type of component	Description of components
4A	Cabinet	36 3/4" panel space should read 61" panel space
2B	Motor	Add 'Oster Model 9, type ES-487 or equivalent.'
1K	Relays	Add 'or equivalent.'
2K	"	
3K	"	
1P	Plug	Mating part is not listed in parenthesis; it is to be found under the heading 'function' in the parts list
4P	"	
5P	"	
6P	"	
28R	Resistor	Should be 3 watts.
6T	Transformer	Should read '.....insulated for 30 kv dc in air; .....
7T	"	Part No. should be 'Beta #20114.'

* *

ADDENDA . . . . . .

11C	Capacitor	0.01 mfd, 60 kv dc; Beta #21726.
12C	"	8-8 mfd, 600 V dc: paper, Tobe-Deutschmann Corp., 'Filtermite,' type PT-SC-11;4 pin plug-in base.
3E	Spark gap	Standard automobile spark plug, 10 mm thread; Champion or equivalent
2H	Handle	Handle, Stanley, #482J, number 2, (see parts list for color).
3H	Clamp	Tube clamp for small shell octal; Birtcher #926A.
4H	"	Tube clamp for intermediate shell octal; Birtcher #926B.
5H	"	Tube clamp for medium shell octal; Birtcher #926C.
4I	Lamp	Neon glow lamp, 117 volts (nominal); 1 watt, double contact bayonet candelabra base; NE-32, G-10 bulb. (Requires external resistor).
8J	Receptacle	4 pins; AN 3102-18-4S.
9J	"	4 pins; AN 3102-14S-2S.
10J	"	8 pins; AN 3102-22-18P.
11J	"	8 pins; AN 3102-22-18S.

Item # and Letter Desig.	Type of Component	Description of Components
20K	Relay	Contactor; 117 volts ac coil; double pole, normally open contacts; 115 V at 35 amperes or 202 volts at 25 amperes; Mercury contacts; Ebert Model #EM4.
21K	"	117 volts ac coil; double pole, double throw, 5 amperes, 115 volts ac contacts; dust cover; Octal plug-in base; Potter-Brumfield #KRP-11A or equivalent.
7P	Plug	AN type cable terminating connector; 4 pins; AN 3106-18-4P; with AN 3057-10 cable clamp.
8P	"	AN type cable terminating connector; 4 pins; AN 3106-14S-2P; with AN 3057-6 cable clamp.
9P	"	AN type cable terminating connector; 8 pins; AN 3106-22-18S; with AN 3057-12 cable clamp.
10P	"	AN type cable terminating connector; 8 pins; AN 3106-22-18P; with AN 3057-12 cable clamp.
11P	Plate cap	For 3/8" tube cap; polyethylene insulated cap and lead; 12" lead length; Alden #91-1SL, or equivalent.
12P	"	For 3/8" tube cap; ceramic insulation; The National Co. #SPP3.
13P	"	For 9/16" tube cap; ceramic insulation; The National Co. #SPP9.
32R	Resistor	_____ ohms, 5% tolerance; 1 watt, precision composition; Continental Nobeloy type X-1; (see parts list for ohmage).
33R	"	_____ohms, 10% tolerance; 2 watts; wire wound; IRC type BW2; (see parts list for ohmage).
34R	"	_____ohms, 10% tolerance; 5 watts; wire wound; Ohmite 'Brown Devil' or equivalent; (see parts list for ohmage).
35R	"	_____ohms, 10% tolerance; 10 watts; wire wound; Ohmite 'Brown Devil' or equivalent; (see parts list for ohmage).
36R	"	_____ohms, 10% tolerance; 20 watts; wire wound; Ohmite 'Brown Devil' or equivalent; (see parts list for ohmage).
37R	"	_____ohms, 10% tolerance; 25 watts; wire wound; Ohmite Series 0200, or equivalent; (see parts list for ohmage).
38R	"	_____ohms, 10% tolerance; 50 watts; wire wound; Ohmite Series 0400, or equivalent; (see parts list for ohmage).
39R	"	_____ohms, 10% tolerance. 75 watts; wire wound; Ohmite Series 0700, or equivalent; (see parts list for ohmage).
40R	"	_____ohms, 10% tolerance; 100 watts; wire wound; Ohmite Series 0600 or equivalent; (see parts list for ohmage).

Item # and Letter Desig.	Type of component	Description of Components
41R	Resistor	_____ ohms, 10% tolerance; 200 watts; wire wound; Ohmite Series 0900 or equivalent; (see parts list for ohmage).
42R	"	25 megohms; 15% tolerance. 40 kv; 10 watts; RPC type BFW.
14T	Transformer	Pri.: 110/220 volts; Sec.: 44,000 volts, 8 milli-amperes; start of secondary insulated for 75 kv dc. Beta #201042.
15T	"	Covat; 115/0-135 volts, 30 amperes; Superior Electric Co. type 1126-2P powerstat.
16T	"	Covat; 115/0-135 volts, 45 amperes; Superior Electric Co. type 1156 powerstat.
17T	"	Covat; 230/0-270 volts, 28.0 amperes; Superior Electric Co. type 1256 powerstat.
18T	"	Autotransformer; 230/115 volts, 150 watts; Stancor #P-5064 or equivalent.
19T	"	Autotransformer; 230/115 volts, 500 watts; Stancor #P6141 or equivalent.
20T	"	Autotransformer; 230/115 volts, 1000 watts; Stancor #P-6124 or equivalent.
* See below for 'W'.		
4BP	Binding post	1 pole binding post, '5 way;' 30 amperes, 1,000 volts insulation; red; Superior Electric Co. DF30RC.
5BP	"	1 pole binding post, '5 way;' 30 amperes; 1,000 volts insulation; black; Superior Electric Co. DF30BC.
4CR	Rectifier	Germanium rectifier; type IN34.
5XI	Pilot light holder	Dialco type 95-4635-L46, or equivalent.
7XV	Tube socket	4 pin tube socket, bakelite dielectric; Amphenol #77-MIP-4, or equivalent.
8XV	"	Ceramic cleat receptacle; medium base; 250 volts, 660 watts; Leviton /9062, or equivalent.
2W	Output Cable	RG 8/U coaxial cable.
3W	"	RG 17/U coaxial cable.
4W	"	RG 19/U coaxial cable.
5W	"	RG 59/U coaxial cable.
6W	Interconnecting Cable	8 conductor, #16 stranded cable; rubber insulation on wires, neoprene outer jacket.

STANDARD PARTS LIST FOR INSTRUCTION MANUALS

(Note: Wherever "ac" is specified, this implies 50/60 cycle rating.)

Item Number and Letter Designation	Type of Component	DESCRIPTION
1A	Cabinet	Cabinet, relay rack; for standard 19″ rack panels; See parts list for dimensions, finish and manufacturer's number.
2A	Cabinet	Cabinet, desk panel; for standard 19″ rack panels; See parts list for dimensions, finish and manufacturer's number.
3A	Cabinet	Relay rack, cabinet; 42″ high x 21″ wide x 18″ deep. For standard 19″ rack panels; 36¾″ panel space; black wrinkle finish. Par Metal ER 203, or equivalent.
4A	Cabinet	Relay rack, cabinet; 66½″ high x 21″ wide x 18″ deep. For standard 19″ rack panels; 36¾″ panel space; black wrinkle finish. Par Metal ER 205, or equivalent.
5A	Cabinet	Desk panel cabinet; 10½″ high x 21⅜″ wide x 15″ deep. For standard 19″ rack panels; 8¾″ panel space; black wrinkle finish. Par Metal DL 128, or equivalent.
6A	Cabinet	Desk panel cabinet; 19¼″ high x 21⅜″ wide x 15″ deep. For standard 19″ rack panels; 17½″ panel space; black wrinkle finish. Par Metal DL 1713, or equivalent.
7A	Cabinet	Desk panel cabinet; 28″ high x 21⅜″ wide x 15″ deep. For standard 19″ rack panels; 26¼″ panel space; black wrinkle finish. Par Metal DL 2613, or equivalent.
8A	Chassis	(Dimensions) .....; (Finish) .....; Mfgr. #.....
9A	Chassis	Chassis with integral mounting brackets. 17″ x 13″ x 3″ nominal size; βeta #A101.
10A	Chassis	17″ x 10″ x 2″; black wrinkle finish; Par Metal #B4528 or equivalent.
11A	Chassis	17″ x 13″ x 2″; black wrinkle finish; Par Metal #4535 or equivalent.
12A	Chassis	17″ x 10″ x 3″; black wrinkle finish; Par Metal #B4526 or equivalent.
13A	Chassis	17″ x 13″ x 3″; black wrinkle finish; Par Metal #B4536 or equivalent.
14A	Bracket	Chassis mounting bracket; for 10″ base; Par Metal SB-710, or equivalent.
15A	Bracket	Chassis mounting bracket; for 13″ base; Par Metal SB-713, or equivalent.

Item Number and Letter Designation	Type of Component	DESCRIPTION
16A	Bracket	Angle supporting bracket; 12″ long; 3″ wide; Bud #SA-1350 or equivalent.
17A	Bracket	Angle supporting bracket; 14½″ long, 3″ wide; Bud #SA-1349 or equivalent.
18A	Panel	Standard "W. E. notching." 19″ wide. ⅛″ thick; see parts list for material (aluminum or steel) height, finish and manufacturer's number.
		(All panels below, from 19A to 38A inclusive, are for standard "W.E. notching," 19″ wide, ⅛″ thick.)
19A	Panel	Aluminum; 8¾″ high; black wrinkle finish; Par Metal #6679 or equivalent.
20A	Panel	Aluminum; 8¾″ high; grey wrinkle finish; Par Metal #G 6679, or equivalent.
21A	Panel	Aluminum; 15¾″ high; black wrinkle finish; Par Metal #6683, or equivalent.
22A	Panel	Aluminum; 15¾″ high; grey wrinkle finish; Par Metal #G6683, or equivalent.
23A	Panel	Aluminum; 17½″ high; black wrinkle finish: Par Metal #6684 or equivalent.
24A	Panel	Aluminum 17½″ high; grey wrinkle finish; Par Metal #G 6684 or equivalent.
25A	Panel	Aluminum 19¼″ high; black wrinkle finish; Par Metal #6685 or equivalent.
26A	Panel	Aluminum; 19¼″ high; grey wrinkle finish; Par Metal #G 6685 or equivalent.
27A	Panel	Aluminum: 21″ high; black wrinkle finish: Par Metal #6686, or equivalent.
28A	Panel	Aluminum; 21″ high; grey wrinkle finish: Par Metal #G 6686 or equivalent.
29A	Panel	Steel; 8¾″ high: black wrinkle finish; Par Metal #6604 or equivalent.
30A	Panel	Steel; 8¾″ high; grey wrinkle finish; Par Metal #G 6604 or equivalent.
31A	Panel	Steel: 15¾″ high; black wrinkle finish; Par Metal #6608, or equivalent.
32A	Panel	Steel; 15¾″ high; grey wrinkle finish; Par Metal #G6608, or equivalent.
33A	Panel	Steel; 17½″ high; black wrinkle finish; Par Metal #6609 or equivalent.
34A	Panel	Steel; 17½″ high; grey wrinkle finish; Par Metal #G 6609 or equivalent.
35A	Panel	Steel: 19¼″ high; black wrinkle finish; Par Metal #6610 or equivalent.
36A	Panel	Steel 19¼″ high; grey wrinkle finish: Par Metal #G 6610 or equivalent.

Item Number and Letter Designation	Type of Component	DESCRIPTION
37A	Panel	Steel; 21″ high; black wrinkle finish; Par Metal #6611 or equivalent.
38A	Panel	Steel; 21″ high; grey wrinkle finish; Par Metal #G 6611 or equivalent.
39A	Tank	Steel tank, frame and cover assembly. See parts list for appropriate βeta drawings.
1B	Motor	1/20 HP; 1725 RPM; 115 V dc shunt wound; GE #7308.
2B	Motor	1/40 HP; 1725 RPM; 115 V ac, split phase, reversible.
1C	Capacitor	0.001 mfd, 60 kv dc; βeta #201021.
2C	Capacitor	0.007-0.007 mfd, 11 kv dc; 1 terminal 11 kv; 1 terminal 22 kv; βeta #00221.
3C	Capacitor	0.008 mfd, 50 kv dc; βeta #21724.
4C	Capacitor	0.01 mfd, 400 V dc; paper; Micamold #339 BR 110, or equivalent.
5C	Capacitor	0.01-0.01 mfd, 16 kv dc; 1 terminal 16 kv; 1 terminal 32 kv. βeta #20123.
6C	Capacitor	0.02 mfd, 30 kv dc; βeta #21723.
7C	Capacitor	0.25 mfd, 400 V dc; paper; Cornell-Dubilier #PJ4P25, or equivalent.
8C	Capacitor	2 mfd, 200 V dc; metallized paper; Aerovox P82 or equivalent.
9C	Capacitor	20 mfd, 150 V dc; dry electrolytic; Aerovox PRS, or equivalent.
10C	Capacitor	100 mfd, 50 V dc, dry electrolytic; Sangamo MTH-5010 or equivalent.
1E	Shield	Anti-corona tube socket shield, open end type. βeta #ACS-1.
2E	Shield	Anti-corona tube socket shield, fully enclosed type. βeta #2010-E-1.
1F	Fuse	Extractor post cartridge fuse, quick acting type. 250 volts ac rating. Littelfuse type 3AG or equivalent (fuse ratings 1/16 to 6 amperes). See parts list for current rating.
2F	Fuse	Extractor post cartridge fuse, quick acting type. 250 volts ac rating. Littelfuse type 3AB or equivalent. (Fuse ratings 8 to 20 amperes.) See parts list for current ratings.
3F	Fuse	Extractor post cartridge fuse, quick acting type. 250 volts ac rating. Bussman type BAF or equivalent. (Fuse ratings 10 to 30 amperes.) See parts list for current rating.

Item Number and Letter Designation	Type of Component	DESCRIPTION
1H	Clamp	High voltage output cable clamp assembly as per drawing β HVCC-3; See parts list for cable size.
1I	Lamp	Neon glow lamp, 117 volts (Nominal); 1/25 watt, Miniature bayonet base; NE-51, T-3¼ bulb. (Requires external resistor.)
2I	Lamp	Incandescent pilot lamp; #6S6; 115 V; 6 watts; Candelabra base; S6 bulb
3I	Lamp	Incandescent lamp; standard Edison screw base. See parts list for voltage and wattage ratings.
1J	Receptacle	2 pole, standard plug, recessed male receptacle; 110 volts, 15 amperes, 250 volts, 10 amperes; Amphenol type 61M10.
2J	Receptacle	2 pole, standard flush female receptacle; 110 volts, 15 amperes; 250 volts, 10 amperes, Amphenol type 61F1.
3J	Receptacle	3 pole recessed male receptacle (motor connector); 125 volts, 15 amperes; 250 volts, 10 amperes; Hubbell "Twistlock" 7556.
4J	Receptacle	3 pole recessed male receptacle (motor connector); 250 volts, 20 amperes; 575 volts, 10 amperes; Hubbell "Twistlock" 7327.
5J	Receptacle	"AN" type chassis-mounted connector; See parts list for number of pins and AN assembly number; AN3102.....-.....
6J	Receptacle	Banana jack; Birnbach #403 or equivalent.
7J	Receptacle	Giant jack; Birnbach #394, or equivalent.
1K	Solenoid	115 volts ac coil; GE #CR 9503-208D.
2K	Solenoid	115 volts ac coil; GE #CR 9503-209C.
3K	Solenoid	115 volts ac coil; Allen Bradley Bulletin 860 #4PPW.
4K	Relay	115 volts ac coil; single pole, double throw, 10 amperes, 115 volts ac contacts; Advance 953B, or equivalent.
5K	Relay	115 volts ac coil; double pole, double throw, 10 amperes, 115 volts ac contacts; Leach type 1127 or equivalent.
6K	Relay	117 volts ac coil; double pole, double throw, 10 amperes, 115 volts ac contacts; Octal plug-in socket base; Advance 964B-P.
7K	Relay	1 milliampere dc, 2200 ohm coil; single pole, double throw, 5 amperes, 115 volt ac contacts; Advance type 1200.

Item Number and Letter Designation	Type of Component	DESCRIPTION
8K	Relay	½ milliampere dc; 29,000 ohm coil; single pole, double throw; 110 volt ac contacts; Kurman type N220C44Y.
9K	Relay	115 volts ac coil; double pole, single throw, normally open, 15 amperes, 115 volt ac contacts; Potter-Brumfield PR7A.
10K	Relay	24 volts ac coil; double pole, single throw, normally open contacts; 15 amperes, 115 volt ac contacts; Potter-Brumfield PR7A.
11K	Relay	115 volts ac coil; double pole, double throw, 15 amperes, 115 volts ac contacts; Potter-Brumfield PR11A.
12K	Relay	24 volts ac coil; double pole, double throw, 15 amperes, 115 volt ac contacts; Potter-Brumfield PR11A.
13K	Relay	24 volts ac coil; double pole, double throw, 3 amperes, 115 volt ac contacts; Potter-Brumfield KR11A.
14K	Relay	110 volts dc coil; double pole, double throw, 8 amperes, 115 volt ac contacts; Potter-Brumfield MR11D.
15K	Relay	110 volts dc coil; single pole, double throw, 8 amperes, 115 volt ac contacts; Potter-Brumfield MR5D.
16K	Relay	115 volts ac coil; double pole, single throw, normally open, 10 amperes, 115 volt ac contacts; Time delay 5-20 second adjustable; Leach 1154-T, or equivalent.
17K	Relay	115 volts ac coil; double pole, double throw, 2 amperes, 115 volt ac contacts; Allied type BJ6A115.
18K	Relay	Balanced relay; Coil (+7.5)-(0)-(—7.5) microamperes dc; contacts: single pole, double throw, 5 volts dc, 200 ma. non-inductive load; Weston #534.
19K	Relay	1.4 ma dc, 8000 ohm coil; contact rating: single pole-double throw, 2 amperes, 24 volts dc or 115 volts ac non-inductive load; Sigma type 4F.
1M	Meter	DC microammeter; 50 microamperes full scale; 4″ square bakelite case; Simpson Model 29. Dial labelled as per parts list.
2M	Meter	DC microammeter; 50 microamperes full scale; 3″ square bakelite case; Simpson Model 27; dial labelled as per parts list.
1O	Caster	3″ wheel, neoprene tired; ¼ ton swivel bearing; Darnell #3-73 TDN, or equivalent.
2O	Caster	6″ wheel, neoprene tired; ½ ton swivel bearing; Darnell #4LO6 RDN, or equivalent.
3O	Reductor Box	400:1 ratio; 31 inch-pounds maximum torque; Boston #LW9.
1P	Plug	AN type cable-terminating connector; see parts list for number of contacts; AN 3106-..... number; corresponding AN 3057-..... cable clamp; and socket (j.....) with which the plug mates. (Listed in parenthesis.)

Item Number and Letter Designation	Type of Component	DESCRIPTION
2P	Plug	3 pole female connector; 125 volts, 15 amperes; 250 volts, 10 amperes; Hubbell "Twistlock" #7555.
3P	Plug	3 pole female connector; 250 volts, 20 amperes; 575 volts, 10 amperes; Hubbell "Twistlock" 7313.
4P	Plug	Banana plug; Birnbach #401; See parts list for mating socket. (Listed in parenthesis.)
5P	Plug	Giant plug; Birnbach #397; See parts list for mating socket. (Listed in parenthesis.)
6P	Plug	Giant plug; Birnbach #396; See parts list for mating socket. (Listed in parenthesis.)
1R	Resistor	..... ohms; ..... % tolerance; ..... watts; *(Carbon, wire-wound, precision)*; Manufacturer's #.....
2R	Resistor	470 ohms, 10% tolerance; 2 watts, composition; IRC type BTB or equivalent.
3R	Resistor	100 k ohms, 10% tolerance; 1 watt; composition; IRC type BTA or equivalent.
4R	Resistor	..... ohms, ...% tolerance; .....KV maximum voltage; ..... maximum wattage; Resistance Products Co. type ..... Note: RPC stands for Resistance Products Co. (Harrisburg, Pa.)
5R	Resistor	0.1 megohm; 15% tolerance; 15 kv; 3 watts; RPC type BFQ.
6R	Resistor	0.1 megohm; 15% tolerance; 25 kv; 6 watts; RPC type BFT.
7R	Resistor	0.1 megohm; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
8R	Resistor	0.1 megohm; 15% tolerance; 65 kv; 30 watts; RPC type DPX.
9R	Resistor	0.5 megohm; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
10R	Resistor	1 megohm; 15% tolerance; 15 kv; 3 watts; RPC type BFQ.
11R	Resistor	1 megohm; 15% tolerance; 25 kv; 6 watts; RPC type BFT.
12R	Resistor	1 megohm; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
13R	Resistor	1 megohm; 15% tolerance; 65 kv; 30 watts; RPC type DPX.
14R	Resistor	1.25 megohms; 15% tolerance; 7.5 kv; 2 watts; RPC type BBM.
15R	Resistor	100 megohms; 15% tolerance; 15 kv; 3 watts; RPC type BFQ.
16R	Resistor	100 megohms; 15% tolerance; 25 kv; 6 watts; RPC type BFT.

Item Number and Letter Designation	Type of Component	DESCRIPTION
17R	Resistor	100 megohms; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
18R	Resistor	120 megohms; 10% tolerance; 25 kv; 6 watts; RPC type BFT.
19R	Resistor	180 megohms; 10% tolerance; 40 kv; 10 watts; RPC type BFW.
20R	Resistor	300 megohms; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
21R	Resistor	1000 megohms; 15% tolerance; 15 kv; 3 watts; RPC type BFQ.
22R	Resistor	1000 megohms; 15% tolerance; 25 kv; 6 watts; RPC type BFT.
23R	Resistor	1000 megohms; 15% tolerance; 40 kv; 10 watts; RPC type BFW.
24R	Potentiometer	10 ohms; wire wound; 2 watts; screwdriver shaft with locking nut. Clarostat #43-10 or equivalent.
25R	Potentiometer	100 ohms wire wound, 2 watts; screwdriver shaft with locking nut. Clarostat #43-100 or equivalent.
26R	Potentiometer	1000 ohms; wire wound; 2 watts; screwdriver shaft with locking nut. Clarostat #43-1000 or equivalent.
27R	Potentiometer	10,000 ohms; wire wound; 2 watts; screwdriver shaft with locking nut. Clarostat #43-10,000 or equivalent.
28R	Potentiometer	50,000 ohms, wire wound, 4 watts, screwdriver shaft with locking nut. Clarostat Series 58, or equivalent.
29R	Potentiometer	100,000 ohms, wire wound, 4 watts. screwdriver shaft with locking nut. Clarostat Series 10, or equivalent.
30R	Potentiometer	500,000 ohms, composition, ¼ watt; screwdriver shaft with locking nut; Clarostat series 47, or equivalent.
31R	Potentiometer	1 megohm, composition, ¼ watt; screwdriver shaft with locking nut; Clarostat series 47, or equivalent.
1S	Switch	Door interlock switch; single pole, double throw. 10 amperes, 115 volts contacts ac; Microswitch type 2AC1.
2S	Switch	Spring leaf switch; single pole, double throw, 15 amperes, 115 volt ac contacts; Microswitch type BZ-2RL-A2.
3S	Switch	Toggle switch; double pole, single throw, 3 amperes, 125 volts. ac; screw terminals; Arrow-Hart & Hegeman #8965 or equivalent.
4S	Switch	Toggle switch; double pole, single throw, 12 amperes, 125 volt ac contacts; Arrow-Hart & Hegeman #80600 or equivalent.

Item Number and Letter Designation	Type of Component	DESCRIPTION
5S	Switch	Momentary pushbutton switch; 2 circuits; 1—normally open, 1—normally closed; BREAK BEFORE MAKE; 3 amperes at 125 volts ac contacts with screw terminals; Arrow-Hart & Hegeman #3392A, or equivalent.
6S	Switch	Momentary pushbutton switch; 2 circuits; 1—normally open, 1—normally closed; BREAK BEFORE MAKE; 15 amperes at 125 volts ac contacts; GE #CR 2943-U-103C.
7S	Switch	Rotary selector switch; 2 poles, 2 to 5 positions, shorting; steatite insulation; Centralab #2504.
8S	Switch	Rotary selector switch; 4 poles, 2 to 5 positions; shorting; steatite insulation; Centralab #2514.
9S	Switch	Rotary selector switch; 4 poles, 2 to 5 positions; non-shorting; steatite insulation; Centralab #2515.
10S	Switch	Rotary snap switch; double pole, double throw; 3 amperes, 125 volts ac; with screw terminals. Arrow-Hart & Hegeman #1575, or equivalent.
11S	Switch	Rotary selector switch; ..... poles, ... positions; *(shorting, non-shorting); (ceramic, steatite)* insulation; Manufacturer and number ..... (see parts list for details).
1T	Transformer	Pri: ..... volts; Sec: ..... volts; ..... amperes; Insulation ..... Manufacturer's name and #.....
2T	Transformer	117/22,000 volts, 8 milliamperes; start of secondary insulated for 20 kv dc air; 30 kv dc potted; 60 kv dc, oil; βeta #21714.
3T	Transformer	117/5 volts, 6.5 amperes; 30 kv dc insulation; βeta #24511.
4T	Transformer	Pri: 110/220 volts; Sec: 6.0 volts, 5 amperes, 6.0 volts, 5 amperes; one winding insulated for 150 kv dc; other winding insulated for 600 volts; βeta #201017.
5T	Transformer	117/11,500 volts at 4 ma; start of secondary insulated for 16 kv dc; βeta #20113.
6T	Transformer	117/1.6, 1.6 volts at 1.5 amperes; each secondary winding insulated for dc in air; 50 kv dc potted; 60 kv dc in oil; βeta #20112.
7T	Transformer	115/2.6, 2.6 volts at 5 amperes; each secondary winding insulated for 35 kv dc in air; 50 kv dc potted; 60 kv dc in oil; βeta #20112.
8T	Transformer	115/2.6, 2.6 volts at 5 amperes; each secondary winding insulated for 65 kv dc; βeta #24211.

Item Number and Letter Designation	Type of Component	DESCRIPTION
9T	Transformer	Covat*: 120/0-135 volts, 1.2 amperes. Superior Electric Co. type 10 powerstat.
10T	Transformer	Covat; 115/0-135 volts, 1.5 amperes, General Radio Co. type 200-B variac.
11T	Transformer	Covat; 115/0-135 volts, 3.5 amperes; Superior Electric Co. type 20 powerstat.
12T	Transformer	Covat; 115/0-135 volts, 7.5 amperes; Superior Electric Co. type 116-U powerstat.
13T	Transformer	Covat; 115/0-135 volts, 15 amperes, Superior Electric Co. type 1126 powerstat.
1V	Vacuum Tube Rectifiers	Filament: ..... volts, ... amperes; average plate current: ..... milliamperes maximum; Inverse peak: .....; Mfgr. and # .....
2V	Vacuum Tube Rectifiers	Filament: 1.3 volts, 0.3 amperes; Average current, 2 ma maximum. Inverse peak; 30 kv. Type 1B3.
3V	Vacuum Tube Rectifiers	Filament: 1.6 volts, 1.25 amperes; Average current: 2 milliamperes maximum; Inverse peak: 60 kv; RCA type 5825.
4V	Vacuum Tube Rectifiers	Filament: 2.5 volts, 5 amperes; Average current: 20 milliamperes maximum; Inverse peak: 40 kv; type 8013 or 8013A.
5V	Vacuum Tube Rectifiers	Filament: 5 volts, 6 amperes; Average current; 100 milliamperes maximum; Inverse peak: 40 kv; type 8020.
6V	Vacuum Tube Rectifiers	Filament: 6.0 volts, 4.5 amperes; Average current: 25 milliamperes maximum; Inverse peak: 140 kv; Dunlee type VR3B.
7V	Vacuum Tube Rectifiers	Filament: 5.0 volts, 10 amperes; Average current: 250 milliamperes; Inverse peak: 60 kv; Eimac type 250R.
1W	Line Cord	AC line cord; 6 feet long, 2 conductors, #18 gauge wire, stranded, consisting of 16 strands of #30 wire; neoprene insulation. Cornish Wire Co. #1462, or equivalent.
	NOTE:	XF1 is holder for fuse F1. X13 is holder for lamp I3. XV1 is socket for tube V1, etc.
1XF	Fuse Holder	Buss type HKP fuse assembly, or equivalent (15 amperes. or less, rating.)
2XF	Fuse Holder	Buss type HPC, or equivalent, fuse assembly. (30 amperes, or less, rating.)
1XI	Pilot Light Holder	Dialco type 811308-437 assembly. Clear faceted lens. with built-in resistor.
2XI	Pilot Light Holder	Dialco type 810B-43 assembly, or equivalent: no resistor in base.

* COVAT — COntinuously Variable Auto Transformer, i.e., powerstat, variac, etc.

Item Number and Letter Designation	Type of Component	DESCRIPTION
3XI	Pilot Light Holder	Dialco type 4931-L-2 or equivalent.
4XI	Pilot Light Holder	Dialco type 51901-43 (see parts list for jewel color).
1XV	Tube Socket	Plastic cleat lampholder; medium base; 250 volts, 660 watts; Monowatt #GE 1640-1, or equivalent.
2XV	Tube Socket	Octal tube socket, bakelite dielectric; Amphenol #77-MIP-8 or equivalent.
3XV	Tube Socket	4 prong breadboard type; EBY 12-4.
4XV	Tube Socket	4 pin, medium bayonet, steatite; Johnson Co. #123-210, or equivalent.
5XV	Tube Socket	4 pin, standard jumbo, steatite; Johnson Co. #123-211, or equivalent.
6XV	Tube Socket	Octal bread board; EBY 12-8.
1BP	Binding Post	ICA type 631 ground binding post.
2BP	Binding Post	2 pole binding post, National Co. type FWG.
3BP	Binding Post	2 pole binding post; EBY #37.
1CR	Selenium Rectifier	Half wave section; 115 volts ac in; 130 volts dc out; 100 milliamperes. Federal Telephone and Radio #1004.
2CR	Selenium Rectifier	Full wave bridge; 115 volt ac in; 90 volts dc out; 750 milliamperes; Opad Green B6-750.
3CR	Selenium Rectifier	Full wave bridge instrument rectifier; 5 ma dc maximum; Conant type 160-C.
1TB	Terminal Board	Jones barrier strips, Cinch Jones 2-141; 2 contacts.
2TB	Terminal Board	Jones barrier strips, Cinch Jones 4-141; 4 contacts.
3TB	Terminal Board	Jones barrier strips, Cinch Jones 5-141; 5 contacts.
4TB	Terminal Board	Jones barrier strips, Cinch Jones 10-141; 10 contacts.
5TB	Terminal Board	Jones barrier strips, Cinch Jones 2-142; 2 contacts.
6TB	Terminal Board	Jones barrier strips, Cinch Jones 10-142; 10 contacts.
7TB	Terminal Board	5 position; Precision Metal Products #2603.
8TB	Terminal Board	5 position; Precision Metal Products #2604.
1VR	Line Voltage Regulator	Input, 95-130 volts; output, 110-120 volts; regulation accuracy 0.1%. 150 voltamperes load rating. Sorenson and Co. Model 150-S.
2VR	Line Voltage Regulator	Input, 95-130 volts; output, 110-120 volts; regulation accuracy 0.1%. 250 voltamperes load rating. Sorenson and Co. Model 250-S.
3VR	Line Voltage Regulator	Input, 95-130 volts; output, 110-120 volts; regulation accuracy 0.1%. 500 voltamperes load rating. Sorenson and Co. Model 500-S.